



Measuring End-User Experience in NREN Networks: Leveraging the Google ISP Tool

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Overview

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Outline

- Network Monitoring
- RENU Network Structure
- RENU Traffic Composition
- Google ISP Portal
- Analysis
- Conclusion



Network Monitoring

- With Internet already made affordable and available, more concern lies with user experience.
- Crucial in identifying network performance issues and their causes.

Traditional monitoring tools measure sections of the network.

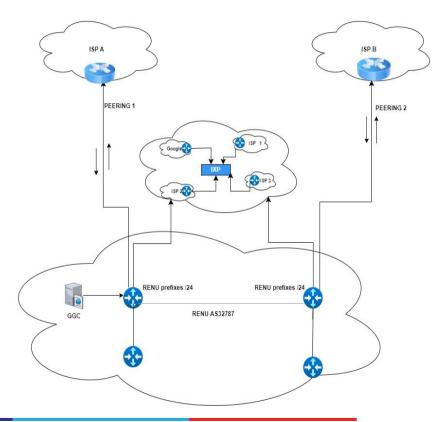
Google ISP – Measures performance from the end-user device to the server.



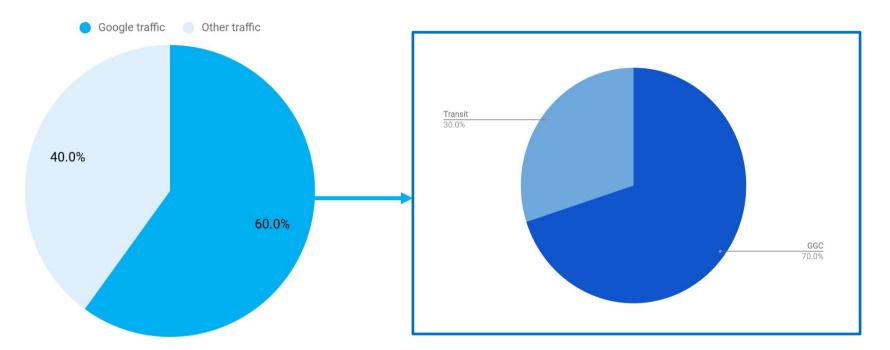


RENU Network Structure

- REN UbuntuNet Alliance
- /24 for each institution (Identity)
- GGC for enhanced performance



RENU Traffic Composition



Of the entire RENU traffic, 60% is Google traffic. 70% of the Google traffic is served by the GGC

Google ISP Portal

The Google ISP Portal exclusively measures Google traffic performance.

Google is interested in the entire performance between the requesting end-user device and the serving infrastructure.

Google uses Autonomous System (AS) numbers to identify and categorize the transit provider that is delivering traffic.

Cacheable traffic is served from Google Global Cache

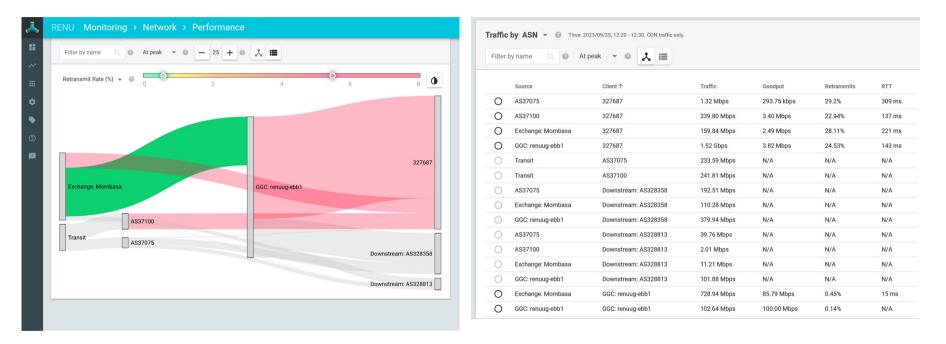






Google ISP Portal





Insights into traffic flows and quality of experience.



Performance Metrics

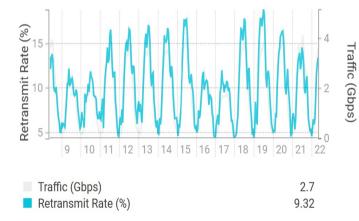
- **Goodput**: The data that is successfully transferred per unit time (Mbps)
- Application Round Trip Time: The amount of time it takes for a packet to be sent from a source to a destination and back (ms)
- **Retransmit Rate**: The percentage of packets that need to be retransmitted because they were lost or corrupted in transit.

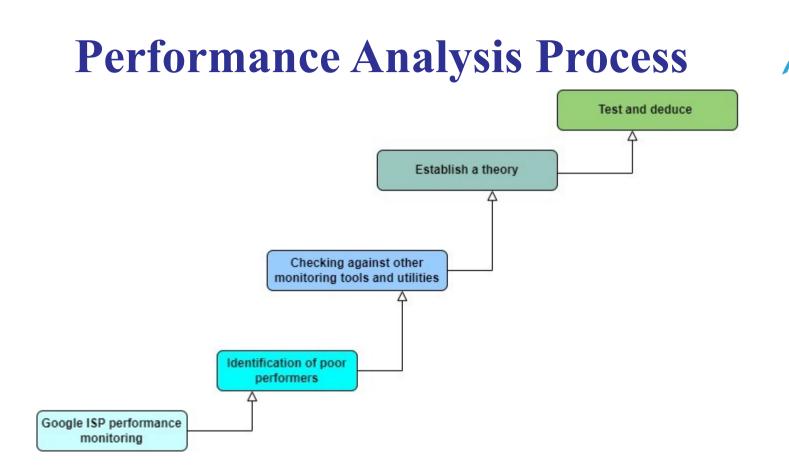


Why Retransmit Rate?

- Retransmit rate was considered the most important among the 3 parameters.
- Traditional tools can measure RTT and Goodput.
- None of the traditional tools measure retransmit rate.







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Google ISP Portal - Performance Analysis

بلي ا	RENU Monitoring > Network > Performance				Switch networks	Q 😝 🗳
	CDN traffic only.					
~	Retransmit Rate (%) 🔻 🎯 Days: 3 👻	Prefix	Traffic	Goodput	Retransmits ψ	RTT
	Orange line denotes overview time. Click timeline to change time.	137.63.150.0/24	1.72 Mbps	1.98 Mbps	96.59%	133 ms
\$		137.63.219.0/24	3.67 Mbps	1.28 Mbps	94.41%	9 ms
~	e te	137.63.196.0/24	3.99 Mbps	1.61 Mbps	80.51%	14 ms
•	(%) 15 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	137.63.137.0/24	5.71 Mbps	287.50 kbps	76.92%	256 ms
0		137.63.171.0/24	2.31 Mbps	3.92 Mbps	75.24%	115 ms
		137.63.209.0/24	12.87 Mbps	641.07 kbps	73.87%	41 ms
	Traffic (Gbps) 0.46	137.63.130.0/24	1.94 Mbps	1.50 Mbps	73.86%	7 ms
	Retransmit Rate (%) 5.59	196.43.152.0/24	5.64 Mbps	611.54 kbps	64.11%	192 ms
		137.63.176.0/24	2.60 Mbps	2.13 Mbps	62.3%	187 ms
	Goodput (Mbps)	137.63.218.0/24	24.22 Mbps	1.48 Mbps	56.97%	131 ms
		137.63.156.0/24	1.71 Mbps	4.13 Mbps	55.08%	11 ms
	- Martin Martin Martin	196.43.172.0/24	54.56 Mbps	1.03 Mbps	51.21%	137 ms
	Retransmit Rate (%)	137.63.139.0/24	3.31 Mbps	1.32 Mbps	48.94%	77 ms
	man man man man	2c0f:f6d0:2b::/48	40.98 Mbps	1.12 Mbps	48.57%	130 ms
	Application RTT (ms)	196.43.188.0/23	4.04 Mbps	1.21 Mbps	48.14%	17 ms
	man Muching Million	137.63.161.0/24	5.29 Mbps	542.86 kbps	47.06%	857 ms
	Max. huk ; were a caller ; and the start of the start	2c0f:f6d0:85::/48	3.31 Mbps	900.00 kbps	46.2%	646 ms
	± csv	196.43.171.0/24	21.15 Mbps	1.27 Mbps	44.8%	95 ms
		196.43.156.0/24	3.25 Mbps	3.08 Mbps	44.12%	13 ms
		137.63.152.0/24	1.61 Mbps	1.70 Mbps	43.78%	389 ms

Prefix based performance analysis according to Goodput, Retransmit Rate and RTT.



Institutional Retransmit Rate Performance

83.31 77.76 75 Average Retransmit Rate(%) 62.73 62.26 62.01 60.09 59.73 56.03 46.57 50 19.23 25 15.16 10.23 0 В С Е F G D Н J Κ А Insititution

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Retransmit Rate Vs Performance

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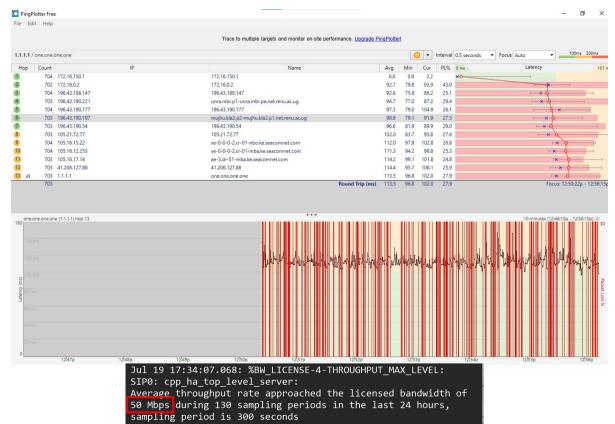


- Reduction in retransmit rate
- Improvement in performance
- Increase in packet loss



Hardware Limitations





Capacity Constraints



🔁 dns.google - PingPlotter Pro

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File Edit Tools Summaries Workspace Help

Show your ISP proof of connection problems. Upgrade PingPlotter!

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Conclusion

NRENs serve a critical sector of the country that is R&E and it is important that these networks where these rely on have good quality networks, which require extensive monitoring and performance measurement to the detail.

Extensive monitoring goes beyond what the traditional tools can currently achieve.







THE END

Thank you for your time